cold body. Combustion occurs with cold air and solid fuel burned in a *thin* layer upon a simple bar grate. As an example of such a construction, the firebox of a tubular boiler may be taken. Combustion is effected rapidly under very unfavorable conditions —the air supply is usually double that theoretically required.

2d Case.—A simple firebox, with a grate, but with a simple brick arch over the fuel bed. Combustion occurs in a *thick* bed of coal. In the case of the furnace working with chimney or natural draft, it is necessary to have sufficient air pressure to overcome the resistance of the fuel bed to the passage of the air and gases.W Combustion is rapid, as in the preceding case, but is effected under more favorable conditions. A thick bed of coal is an excellent medium of combustion; the firebox covered with an arch makes a satisfactory combustion chamber. Practice has shown that, under these conditions, when the fire is well operated, the combustion of coal may be effected with an air supply of about 1.50 times that theoretically required.

A furnace fired in this manner in the Lougansk works, using *a blower,* burns 200 kg of coal per hour per square meter of grate surface. When fireboxes of this type are used with natural or chimney draft only, such a high rate of firing cannot be used; the fuel consumption for such cases should not exceed 70 kg per hour. For the ordinary types of furnaces with a firebox of this kind, such as puddling furnaces, roverberatory furnaces for the melting of iron, copper, etc., and for reheating furnaces, the computation should be based on an air supply 1.50 times that theoretically required, and with very good coal 1.70 times.

3d Case.—Producer-gas-fircd furnaces. These should be figured as having a secondary air supply 1.50 times that theoretically required.

4th Case.—Regenerative or Siemens furnaces. These should be computed for a secondary air supply of 1.25 to 1.50 times the theoretical requirements.

5th Case.—Annealing furnaces, tempering furnaces, chamber brick kilns, etc., should be computed for the theoretical air supply.

(1) This was mentioned in an earlier chapter. This pressure varies with the height between the grate and the hearth of the furnace. The simplest method of providing this pressure is by lowering the grate until it is sufficiently far below the hearth to provide the pressure required to overcome the resistance of the fuel bed.